What Is Claimed Is:

1. In a digital device, a method of generating an output signal that represents a polar angle ϕ for a complex input signal, the method comprising the steps of:

(1) receiving the complex input signal having a real X_0 component and an imaginary Y_0 component;

(2) determining an angle ϕ_1 that is a coarse approximation to the angle ϕ, including the steps of

(2a) determining a Z_0 value that approximates a $[1/X_0]$ value, wherein $[X_0]$ is a truncated approximation of said X_0 component,

(2b) digitally multiplying said Z_0 value by Y_0, resulting in a $[Y_0 Z_0]$ value, and

(2c) determining an arctan of said $[Y_0Z_0]$ value, resulting in said angle ϕ_1;

(3) determining a fine adjustment angle ϕ_2, including the steps of

(3a) digitally computing an intermediate complex number, based on said $[Y_0/X_0]$ value, said intermediate complex number having a real X_1 component and an imaginary Y_1 component,

(3b) determining a Z_1 that approximates a $[1/X_1]$ value, wherein $[X_1]$ is a truncated approximation of said X_1 component,

(3c) digitally multiplying said X_1 component by said $[Z_1]$ value to produce a Z_1X_1 component, and digitally multiplying said Y_1 component by said $[Z_1]$ component to produce a Z_1Y_1 component,

(3d) determining a one's complement of said Z_1X_1 component, and

(3e) digitally multiplying said two's complement of said Z_1X_1 component by said Z_1Y_1 component, resulting in said fine adjustment angle ϕ_2; and

(4) adding said fine adjustment angle ϕ_2 to said angle ϕ_1 to form said output signal that is data used by said digital device.

2. The method of claim 1, wherein step (2a) comprises the step of retrieving said $[Z_0]$ value from a memory device.

3. The method of claim 1, wherein step (2c) comprises the step of retrieving said angle ϕ_1 value from a memory device.

4. The method of claim 1, wherein step (3b) comprises the step of retrieving said $[Z_1]$ value from a memory device.

5. The method of claim 1, wherein step (2a) comprises the step of retrieving said $[Z_0]$ value from a memory device, and wherein step (3b) comprises the step of retrieving said $[Z_1]$ value from said memory device.

6. The method of claim 1, wherein said step (3a) comprises the step of multiplying said X_0 component and said Y_0 component by a tan ϕ_1.

7. The method of claim 1, wherein said step (3a) comprises the step of multiplying said X_0 component and said Y_0 component by said $[Z_0Y_0]$ value.

8. An apparatus that generates an output signal that represents a polar angle ϕ for a complex input signal having a X_0 component and a Y_0 component, comprising:

a first memory that stores one or more Z_0 values indexed by $[X_0]$, wherein $[X_0]$ is a bit truncated version of said X_0 value, wherein said Z_0 value is approximately $1/[X_0]$;

a multiplier that multiplies said Z_0 value by the Y_0 component, resulting in a $[Z_0Y_0]$ value;

a second memory that stores one or more ϕ_1 angles, wherein said ϕ_1 angle is approximately an arctan of $[Z_0Y_0]$;

a digital circuit that multiples said X_0 component and said Y_0 component by said $[Z_0\ Y_0]$ value, resulting in an intermediate complex number having an X_1 component and a Y_1 component;

a fine angle computation stage that determines an angle ϕ_2 based on Y_1/X_1; and

an adder that adds $\phi_1 + \phi_2$ to produce said angle ϕ to form the output signal that is data processed by said apparatus.

9. The apparatus of claim 8, wherein said fine angle computation stage includes:

a set of multipliers that multiply said X_1 component and said Y_1 component by a Z_1 value resulting in a X_1Z_1 component and a Y_1Z_1 component, wherein Z_1 is a bit truncated version of $1/[X_1]$, and wherein $[X_1]$ is a bit truncated version of X_1.

10. The apparatus of claim 9, wherein said Z_1 value is retrieved from said first memory based on said $[X_1]$ value.

11. The apparatus of claim 9, wherein said fine angle computation stage further includes:

a means for implementing a one's complement of said X_1Z_1; and

a second multiplier for multiplying said one's complement of X_1Z_1 by said Y_1Z_1 component.

12. The apparatus of claim 9, wherein said fine angle computation stage further includes:

a means for implementing a two's complement of said X_1Z_1; and

a second multiplier for multiplying said two's complement of X_1Z_1 by said Y_1Z_1 component.

13. The apparatus of claim 8, further comprising:

a scaling shifter, coupled to said digital circuit, wherein said scaling shifter scales said X_1 component in accordance with reciprocal values that are stored in said first memory.

14. The apparatus of claim 13, wherein said scaling shifter also scales said Y_1 component similar to said scaling of said X_1 component.

15. The apparatus of claim 8, wherein said digital circuit is a butterfly circuit that is coupled to an output of said multiplier.

16. In a digital device, a method of generating an output signal that represents a polar angle ϕ for a complex input signal, the method comprising the steps of:

(1) receiving the complex input signal having a real X_0 component and an imaginary Y_0 component;

(2) retrieving a Z_0 value from a first memory, wherein Z_0 is a bit truncated approximation for $1/X_0$;

(3) digitally multiplying said Z_0 value by said Y_0 component, resulting in a $[Y_0Z_0]$ value;

(4) retrieving an angle ϕ_1 from a second memory, wherein ϕ_1 is based on an arctan of said $[Y_0Z_0]$ value;

(5) digitally rotating said input complex signal in a complex plane by said angle ϕ_1 to produce an intermediate complex signal having an X_1 component and a Y_1 component;

(6) digitally computing an angle ϕ_2 that is an approximation to an arctan Y_1/X_1; and

(7) adding said angle ϕ_2 to said angle ϕ_1 to form the output signal that is data used by said digital device.

17. The method of claim 16, wherein said step (6) comprises step of:

(a) retrieving a Z_1 value from said first memory, wherein said Z_1 value is a bit truncated approximation of $1/X_1$; and

(b) digitally multiplying said X_1 component by said Z_1 value to produce a Z_1X_1 component, and digitally multiplying said Y_1 component by said Z_1 value to produce a Z_1Y_1 component;

(c) determining a one's complement of said Z_1X_1 component; and

(d) multiplying said one's complement of said Z_1X_1 component by said Z_1Y_1 component.

18. The method of claim 16, wherein step (5) comprises the step of multiplying said input complex signal by a tan ϕ_1.

19. The method of claim 16, wherein step (5) comprises the step of multiplying said input complex signal by said $[Y_0Z_0]$ value.

20. In a digital device, a method of symbol timing synchronization, the method comprising the steps of:

(1) receiving complex data samples of one or more symbols;

(2) correlating said complex data samples with a complex conjugate of a preamble data set, resulting in correlated complex data samples, each

correlated complex data sample represented by a real sample and an imaginary sample;

(3) selecting between said real samples and said imaginary samples, resulting in a set of selected samples;

(4) generating a complex number based on said set of selected samples; and

(5) determining an angle in a complex plane associated with said complex number, whereby said angle represents symbol synchronization for the communications device.

21. The method of claim 20, further comprising the step of:

(5) multiplying said angle by $\pi/2$ to determine an offset μ that indicates symbol synchronization.

22. The method of claim 20, wherein step (2) comprises the step of multiplying said received complex data samples with said preamble data set.

23. The method of claim 20, wherein said step (3) comprises the step of selecting the larger of said real samples and said imaginary samples.

24. The method of claim 20, wherein step (4) comprises the steps of:

(a) determining a Fourier transform based on set of selected data samples; and

(b) evaluating said Fourier transform at $\pi/2$.

25. The method of claim 20, wherein step (4) comprises the steps of:

(a) determining which of said selected data samples has the largest magnitude;

(a) selecting n adjacent samples from the selected data samples that includes said largest magnitude sample;

(c) determining a Fourier transform of said n adjacent data samples; and

(d) evaluating said Fourier transform at $\pi/2$, resulting in said complex number.

26. The method of claim 20, wherein said complex number is in a rectangular format, and wherein step (5) comprises the step of:

converting said complex number to polar format having a magnitude and said angle.

27. The method of claim 20, where step (4) comprises the steps of:

(a) determining which of said selected data samples has the largest magnitude;

(a) selecting 4 adjacent samples from the selected data samples, represented by r(-1), r(0), r(1), and r(2), wherein said largest magnitude data sample is one of r(0) and r(1);

(c) determining a Fourier transform of said 4 adjacent data samples; and

(d) evaluating said Fourier transform at $\pi/2$, resulting in said complex number.

28. The method of claim 27, wherein step (c) comprises the steps of:

(I) determining r(0) - r(2), to produce in a real part of said complex number; and

(ii) determining r(-1) - r(1), to produce in an imaginary part of said complex number.

29. In a digital device, a method of carrier recovery, the method comprising the steps of:

(1) receiving complex data samples of one or more symbols;

(2) correlating said complex data samples with a complex conjugate of a preamble data set, resulting in correlated complex data samples;

(3) selecting one of said correlated complex data samples;

(4) determining an angle in said complex plane based on said selected correlated complex data sample, whereby said angle represents a carrier phase offset in the digital device.

30. The method of claim 29, wherein step (3) comprises the step of selecting a largest of said correlated complex data samples.

31. The method of claim 29, wherein said complex number is in a rectangular format, wherein step (4) comprises the step of converting said complex number to a polar format having a magnitude and said angle.

32. In a digital device for generating an output signal that represents a polar angle φ for a complex input digital signal, a method of converting Cartesian data of said input digital signal to polar angle data of said output signal, comprising the steps of:

(1) receiving the input digital signal; and

(2) determining at least two subangles, the combination of which subangles represents the polar angle φ.

33. The method of claim 32, wherein step (2) comprises the step of: (a) determining at least one subangle by using a memory device.

34. The method of claim 32, wherein said step (2) comprises the step of:

(a) determining at least one subangle by using a trigonometric function of a subangle as an approximation for the subangle.

35. The method of claim 34, wherein said step (a) comprises of the step of:

(i) determining said trigonometric function using a previously determined subangle and said Cartesian data of said input digital signal.

36. The method of claim 35, wherein said step (i) comprises the step of determining said trigonometric function by rotating said Cartesian data of said input digital signal by said previously determined subangle.